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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,893	03/31/2004	Takashi Yamazaki	ASAM.0118	4985

7590
REED SMITH LLP
Suite 1400
3110 Fairview Park Drive
Falls Church, VA 22042

04/04/2007

EXAMINER

BRADLEY, MATTHEW A

ART UNIT	PAPER NUMBER
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2187

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/812,893	YAMAZAKI ET AL.	
	Examiner	Art Unit	
	Matthew Bradley	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This Office Action has been issued in response to amendment filed 8 January 2007. Applicant's arguments have been carefully and fully considered but are moot in view of the new ground(s) of rejection as necessitated by amendment. Accordingly, this action has been made FINAL.

Claim Status

Claims 1-23 remain pending and are ready for examination.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims **1-23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ellis et al (U.S. 2003/0212859), hereinafter referred to as Ellis, and in view of DeNicola (U.S. 5,666,539), hereinafter referred to as DeNicola.

As per independent claim **1**, Ellis teach,

- a plurality of hard disk drives; and (Figure 3 items 311 as taught in Paragraph 0040)
- a controller constructed by including a host interface which receives a request for a data read and request for a data write from/to said hard disk

drives from said information processing apparatus, (Figure 3 items 302 as taught in Paragraph 0040)

- a disk interface connected to said hard disk drives so as to be able to communicate therewith through a communication path which performs data input/output to/from said hard disk drives, (Figure 3 items 316 as taught in Paragraph 0040)
- a memory, (Paragraph 0046 'taught as RAM')
- a CPU which controls said host interface, said disk interface, and (Figure 3 item 306 as taught in Paragraph 0040)
- a time counting mechanism, (Paragraph 0052 'taught as state machine')
- wherein a logical volume is formed in a RAID group with disk drive redundancy made up of a plurality of said hard disk drives, said disk array apparatus comprising: (Paragraph 0066 'taught as a logical storage unit')
- an access time storage section which stores, upon reception of a request for a data read or request for a data write from/to said logical volume from said information processing apparatus, a time acquired from said time counting mechanism as an access time in said memory in association with an identifier of said RAID group in which said logical volume is formed; and (Paragraph 0064 and 0065)

Ellis does not explicitly teach, a power saving mode execution section which refers to said access time stored in said memory and sets a number of said hard disk drives according to the redundancy of said RAID group to a power saving mode when

the difference between a current time acquired from said time counting mechanism and said access time exceeds a certain time.

DeNicola teaches, a power saving mode execution section which refers to said access time stored in said memory and sets a number of said hard disk drives according to the redundancy of said RAID group to a power saving mode when the difference between a current time acquired from said time counting mechanism and said access time exceeds a certain time (Column 3 lines 15-25).

Ellis and DeNicola are analogous art because they are from the same field of endeavor namely, power management of disk systems.

At the time of invention, it would have been obvious to one of ordinary skill in the art, having both the teachings of Ellis and DeNicola before him/her to combine the individual spin down and spin up management of disk drives of DeNicola with Ellis for the benefit of conserving power.

The suggestion for doing so would have been that, based upon the statistical record of the accesses to the disk drives, and controlling spin-ups and spin-downs of the disk drives to reduce power consumption (Column 3 lines 1-6 of DeNicola).

Therefore, it would have been obvious to combine Ellis with DeNicola for the savings of power to obtain the invention as specified in claims 1-23.

As per dependent claim 2, the combination of Ellis and DeNicola teach, a plurality of communication paths which connect said disk interface and said plurality of hard disk drives, (Figure 3 as shown with respect to the interconnections of Ellis), wherein said hard disk drives are connected to any one of said communication paths so

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as to be able to communicate therewith, (Figure 3 of Ellis), a communication path selection section which selects said communication path having the least number of said hard disk drives in a power saving mode is provided, and said power saving mode execution section sets said hard disk drives connected so as to be able to communicate with said communication path selected by said communication path selection section to a power saving mode (Paragraph 0036 of Ellis).

As per dependent claims 3 and 15, the combination of Ellis and DeNicola teach, a read request responding section which responds, upon reception of said request for a read from said logical volume formed by including said hard disk drives in said power saving mode from said information processing apparatus, to said read request using the redundancy of said RAID group from said hard disk drives not in a power saving mode out of said hard disk drives making up said logical volume; and (Paragraph 0073 'taught as READ operation' of Ellis), a power saving mode cancellation section which cancels the power saving mode of said hard disk drives in a power saving mode after said read request responding section responds to said read request (Paragraph 0036 'taught as a host command used to change the power mode' of Ellis).

As per dependent claims 4 and 16, the combination of Ellis and DeNicola teach, a spare drive storage section which stores duplicates of data stored in said hard disk drives in spare drives which are reserved drives for said hard disk drives before said power saving mode execution section sets said hard disk drives to a power saving mode; (Paragraph 0064 and 0065 of Ellis *The Examiner notes that the system of Ellis teach a RAID 1 configuration, thus anticipating the instant limitation of duplicates*), a

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write request responding section which responds, upon reception of said request for a write to said logical volume formed by including said hard disk drives in a power saving mode, to said write request by regarding said hard disk drives not in a power saving mode out of said hard disk drives making up said logical volume and said spare drives as said RAID group in which said logical volume is formed; and (Paragraph 0036 as taught in Paragraph 0075 'taught as a host command that is passed to the media controller to wake the disks' of Ellis), a power saving mode cancellation section which cancels the power saving mode of said hard disk drives in a power saving mode after said write request responding section responds to said write request and stores duplicates of data stored in said spare drives in said hard disk drives whose power saving mode has been canceled (Paragraph 0036 'taught as a host command used to change the power mode' of Ellis)

As per dependent claims **5** and **17**, the combination of Ellis and DeNicola teach, a position information storage section which stores position information of the data written in said spare drives by said write request responding section according to said write request in said memory, (Paragraph 0043 of Ellis '*The Examiner notes that the system of Ellis is able to address each drive independently, thereby anticipating the instant limitation*').), wherein said power saving mode cancellation section stores duplicates of said data stored in the positions indicated by said position information of said spare drives in said hard disk drives whose power saving mode has been canceled (Paragraph 0036 'taught as a host command used to change the power mode' of Ellis).

As per dependent claims **6** and **18**, the combination of Ellis and DeNicola teach, a write request responding section which writes, upon reception of said request for a write to said logical volume formed by including said hard disk drives in a power saving mode, the data accompanying said write request in only said hard disk drives not in a power saving mode out of said hard disk drives making up said logical volume and responds to said write request; and (Paragraph 0036 of Ellis 'taught as a host command used to change the power mode', and Paragraph 0075 of Ellis 'as the media controllers are listening for the host commands to wake the drives – which is then operable for the WRITE operation'; as shown in claim 31), a power saving mode cancellation section which cancels the power saving mode of said hard disk drives in a power saving mode after said write request responding section responds to said write request (Paragraph 0036 of Ellis 'taught as a host command used to change the power mode'), generates data to be stored in said hard disk drives in a power saving mode using the redundancy of said RAID group from the data stored in said hard disk drives not in a power saving mode out of said hard disk drives making up said logical volume and stores said data generated in said hard disk drives whose power saving mode has been canceled (Paragraph 0089 of Ellis).

As per dependent claims **7** and **19**, the combination of Ellis and DeNicola teach, a position information storage section which stores position information in said hard disk drives of the data written in said hard disk drives in a power saving mode in said memory for said write request, (Paragraph 75 as shown in paragraph 0043 of Ellis 'taught as a addressing the storage media') wherein said power saving mode

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cancellation section generates data to be stored at positions indicated by said position information of said hard disk drives in a power saving mode using the redundancy of said RAID group from the data stored in said hard disk drives not in a power saving mode out of said hard disk drives making up said logical volume and stores said generated data in said hard disk drives whose power saving mode has been canceled (Paragraph 0089 of Ellis 'taught as transfer of data' with respect to the citing above).

As per independent claim 8, the combination of Ellis and DeNicola teach,

In addition to the limitations presented with respect to independent claim 1, claim 8 adds the following limitations:

- a power saving start time storage section which stores the second time acquired from said time counting mechanism as a power saving start time in said memory (Paragraph 0036 of Ellis taught as the timer that expires after the last host access) in association with an identifier of said RAID group when said first or second hard disk drives are set to a power saving mode by said power saving mode execution section; and (Paragraph 0036 with respect to claim 29)
- a power saving mode cancellation section which refers to said power saving start time and cancels the power saving mode of said first or second hard disk drives in a power saving mode when the difference between said power saving start time and a third time acquired from said time counting mechanism exceeds a certain time (Paragraph 0036 of Ellis 'taught as a host command used to change the power mode').

As per dependent claim **9**, the combination of Ellis and DeNicola teach, wherein the usage mode of each said RAID group is stored in said memory, and when said RAID group consists of said first hard disk drives and said second hard disk drives, said power saving mode execution section sets a number according to the redundancy of said RAID group or an arbitrary number of said first or second hard disk drives to a power saving mode according to said usage mode of said RAID group (Paragraph 0041 of Ellis).

As per dependent claim **10**, the combination of Ellis and DeNicola teach, a continuous operation time storage section which stores a continuous operation time for each said RAID group in said memory; and a batch spare execution section which stores duplicates of data stored in all said first or second hard disk drives making up said RAID group whose said continuous operation time exceeds a certain time in spare drives which are reserved parts of said first or second hard disk drives and sets all said first or second hard disk drives making up said RAID group to a power saving mode (Paragraph 0041 and paragraph 0043 of Ellis).

As per dependent claim **11**, the combination of Ellis and DeNicola teach, an accumulated operation time storage section which stores an accumulated operation time for each of said first or second hard disk drives in said memory, wherein said power saving mode execution section sets said first or second hard disk drives whose said accumulated operation time is long out of said first or second hard disk drives making up said RAID group to a power saving mode (Paragraph 0036 of Ellis 'taught as

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a timer that expires from last host access for entering a mode of reduced power consumption').

As per dependent claim **12**, the combination of Ellis and DeNicola teach, wherein after canceling the power saving mode of said first or second hard disk drives whose power saving mode cancellation section is set to a power saving mode, said power saving mode execution section sets said first or second hard disk drives whose said operation time is long out of said first or second hard disk drives of the RAID group including said first or second hard disk drives to a power saving mode (Paragraph 0064 and 0065 of Ellis).

As per dependent claim **13**, the combination of Ellis and DeNicola teach, a load time storage section which stores the time at which the head of each of said first or second hard disk drives is loaded as the load time in said memory; and an unload execution section which unloads the heads of said hard disk drives whose difference between said load time and the time acquired from said time counting mechanism exceeds a certain time (Paragraph 0044 of Ellis).

As per dependent claim **14**, the combination of Ellis and DeNicola teach, an accumulated operation time storage section which stores the accumulated operation time of each of said first or second hard disk drives in said memory; (Paragraph 0036 of Ellis 'taught as a the timer') an error count storage section which stores a count of errors produced at each of said first or second hard disk drives in said memory; (Paragraph 0039 of Ellis 'taught as an error report') and a dynamic spare execution section which stores duplicates of data stored in said first or second hard disk drives

whose said error count exceeds a certain error count according to said accumulated operation time in spare drives which are reserved parts of said first or second hard disk drives (Paragraph 0044 of Ellis).

As per independent claim **20**, the combination of Ellis and DeNicola teach,

- a step of storing, upon reception of a request for a data read or request for a data write from/to said logical volume from said information processing apparatus, a first time acquired from said time counting mechanism as an access time in said memory in association with an identifier of said RAID group in which said logical volume is formed; (Paragraph 0052 of Ellis)
- a step of referring to said access time stored in said memory and checking whether the difference between a second time acquired from said time counting mechanism and said access time exceeds a certain time or not; (Paragraph 0052 of Ellis 'taught as referring to state machines')
- a step of setting a number of said first hard disk drives according to the redundancy of said RAID group to a power saving mode when said RAID group whose difference between the second time acquired from said time counting mechanism and said access time exceeds a certain time consists of only said first hard disk drives; (Paragraph 0036 of Ellis and Column 3 lines 15-25 of DeNicola)
- a step of setting an arbitrary number of said second hard disk drives to a power saving mode when said RAID group whose difference between the time acquired from said time counting mechanism and said access time

exceeds a certain time consists of only said second hard disk drives;

(Paragraph 0036 of Ellis and Column 3 lines 15-25 of DeNicola)

- a step of storing, when said first or second hard disk drives are set to a power saving mode, a third time acquired from said time counting mechanism as a power saving start time in said memory in association with an identifier of said RAID group; and (Paragraph 0043)
- a step of referring to said power saving start time and canceling the power saving mode of said first or second hard disk drives in a power saving mode when the difference between said power saving start time and the time acquired from said time counting mechanism exceeds a certain time (Paragraph 0036 as taught in Paragraph 0075 'taught as a host command that is passed to the media controller to wake the disks').

As per independent claim **21**, the combination of Ellis and DeNicola teach,

In addition to the limitations presented with respect to independent claim 1, claim 21 adds the following limitations:

- a power saving mode execution section which refers to said access time stored in said memory and sets a number of said hard disk drives of said RAID group as less than a total number of said hard disk drives constituting said RAID group to a power saving mode when the difference between a current time acquired from said time counting mechanism and said access time exceeds a certain time (Column 3 lines 15-25 of DeNicola).

As per independent claim **22**, the combination of Ellis and DeNicola teach,
In addition to the limitations presented with respect to independent claim 8, claim 22 adds the following limitations:

- a power saving start time storage section which stores the second time acquired from said time counting mechanism as a power saving start time in said memory in association with an identifier of said RAID group when said first or second hard disk drives are set to a power saving mode by said power saving mode execution section; and a power saving mode cancellation section which refers to said power saving start time and cancels the power saving mode of said first or second hard disk drives in a power saving mode when the difference between said power saving start time and a third time acquired from said time counting mechanism exceeds a certain time (Column 2 lines 45-55 of DeNicola).

As per independent claim **23**, the combination of Ellis and DeNicola teach,
In addition to the limitations presented with respect to independent claim 1, claim 20 adds the following limitations:

- *a step of setting a number of said first hard disk drives of said RAID group as less than a total number of said first hard disk drives constituting said RAID group to a power saving mode when said RAID group whose difference between the second time acquired from said time counting mechanism and said access time exceeds a certain time consists of only said first hard disk drives; (Column 3 lines 15-25 of DeNicola)*

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew Bradley whose telephone number is (571) 272-8575. The examiner can normally be reached on 6:30-3:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald A. Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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BRP/mb

ms


Brian R. Peugh
Patent Examiner

4/2/07